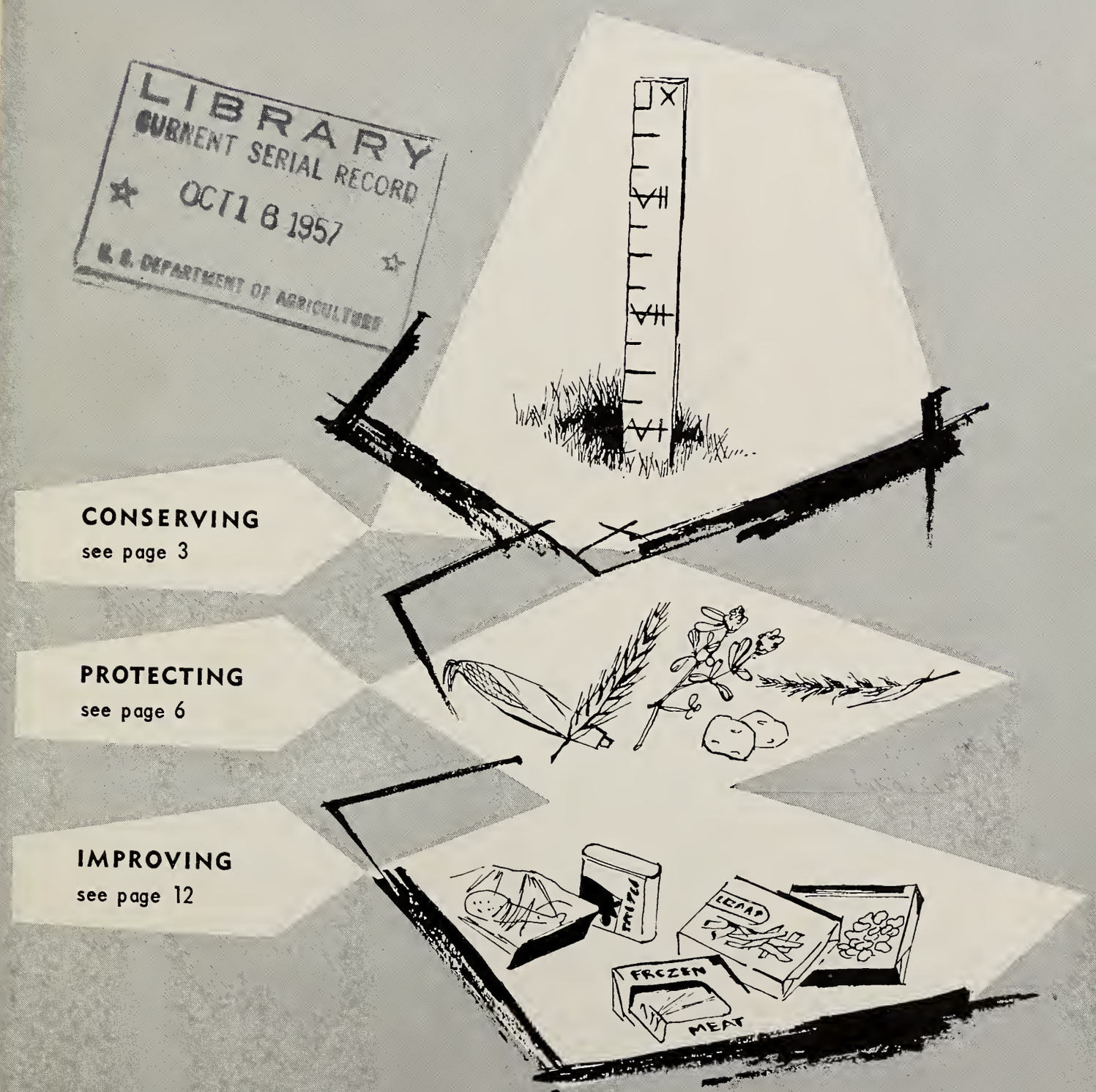
AGRICULTURAL Research



UNITED STATES DEPARTMENT OF AGRICULTURE • OCTOBER 1957

AGRICULTURAL
Research

Vol. 6—October 1957—No. 4

CONTENTS

Managing Editor: J. F. Silbaugh. Assistant Editor: J. R. Deatherage. Contributors to this issue: M. S. Peter, D. R. Klein, E. Evers, P. K. Schultz.

Emergency

Are we prepared to protect our country's agriculture *in case of emergency?* We mean outbreaks of foreign diseases and pests of livestock and crops, or radioactive fallout from atomic attack, or assault with biological warfare (intentional use of germs, poisons, or special chemicals).

There is both warning and reassurance in the series of articles, "In Case of Emergency," that AGRICULTURAL RESEARCH concludes this month with the story on pages 6 and 7.

One thing we must all keep in mind: There is no reason for terror in facing any of these threats. There *are* defenses for them. No one need become panicky about secret superweapons, poisons that can kill millions, or nonsense about mystery germs that could wipe out our livestock or crops.

Not that the possibilities aren't serious—they are. The country depends on the production of our farms. We could be seriously crippled by a BW attack that limited our food and our sources of clothing and medical supplies.

But our team of USDA, State, and local specialists—experienced in handling similar outbreaks—is ready to act in case of emergency. This team has long been operating on a peacetime basis and can quickly expand if the need arises.

Part of their everyday job is to stand guard. All incoming livestock, plants, and food products are rigidly inspected to keep out foreign diseases and pests. If some do get in, the team is alert to recognize them and counterattack.

Now, it's vital that we meet outbreaks quickly to prevent diseases or insects from spreading. This means that local veterinarians, county agents, and farmers themselves share a heavy responsibility. A farmer should report any increase in native diseases or the appearance of unusual diseases in his livestock or poultry to his veterinarian or State veterinarian immediately. Crop damage from an unfamiliar disease or insect should be reported to his county agent. Such reports set the Federal-State team into action.

Aids are available to help everyone understand how to do his part in case of emergency. This is important. Carelessness by one person could be as costly as sabotage itself.

Agricultural Research is published monthly by the Agricultural Research Service, United States Department of Agriculture, Washington 25, D. C. The printing of this publication has been approved by the Bureau of the Budget, September 16, 1955. Yearly subscription rate is $1 in the United States and countries of the Postal Union, $1.35 in other countries. Single copies are 15 cents each. Subscription orders should be sent to the Superintendent of Documents, Government Printing Office, Washington 25, D. C.

MAKING OUR MUCK SOILS LAST LONGER

Higher water tables can slow the rate at which a valuable resource is now burning away

SUBSIDENCE POST was sunk 9 feet deep and flush with the ground surface at the Belle Glade station in 1924 and the house was built with its third step at ground level. The muck soil has since "evaporated into thin air," exposing 3½ feet of the post and leaving the house standing on stilts.

■ THE MUCK SOILS on which we grow some choice components of our diet—vegetables and other valuable products—are literally burning up at an alarming rate. There are nearly 80 million acres of these soils on the outlying fringe of this country.

USDA and other researchers are seeking the basis for a farming pattern that will use this resource efficiently, yet use it up sparingly.

Soil subsidence—the continual shrinkage of soil and lowering of its level—is the evidence that this highly organic material is oxidizing and disappearing into the air as gases. Some soil scientists estimate that half of our best organic soils have been lost in this way within the past 50 years. The Florida Everglades—largest peat and muck tract in the world—illustrate the process and its study.

The Everglades soils were formed in a shallow trough of limestone 40 miles wide and 100 miles long extending southward from Lake Okeechobee in southern Florida. Originally covered with water draining from the lake, this trough ultimately became filled with peat—undecomposed residue made up of water weeds and marsh vegetation. Near the lake silt and clay were washed in and mixed with the accumulating peat to form a true muck with 15 to 70 percent mineral content and 85 to 30 percent peat. Mucks are the finest of soils for vegetables and sugarcane. The remaining Everglades soil includes from 85 to 96 percent organic matter.

Much Florida muck farmed

About 640,000 acres of these organic soils are agricultural in character; of this acreage, about 40 percent is farmed, producing some $45 million a year in winter vegetables, sugarcane, and beef. The rest of the Everglades has too shallow a soil (3 feet or less) for farming or too porous a rock bed for water control. This part has been set aside by the Central and Southern Florida Flood Control District for water storage and wildlife.

The peat could not decompose until the area was drained for agriculture.

(*please turn page*)

EFFECT OF MOLE DRAINS at various spacings on soil water table is being checked in 8-acre field at Everglades Experiment Station. ARS engineer J. C. Stephens measures water level in the sunk piezometer. A spare piezometer is held at left by Florida station engineer D. S. Harrison. Study shows durability and best length and spacing for mole drains.

BULLET-SHAPED TOOL on tractor is drawn through muck at 2½ feet deep to form "mole tunnels" for irrigation and drainage. Raising or lowering water in border ditch controls soil water table. Mole drains last several years.

Farming began on the mucks about 1910, accelerated and spread onto the peats after discovery of copper's value as a minor element by Florida Agricultural Experiment Station around 1925. Cropping extended to the present area during World War II.

Study shows shrinkage rate

J. C. Stephens, ARS hydraulic engineer at the State's Fort Lauderdale field laboratory, and D. S. Harrison, agricultural engineer of the Florida Agricultural Experiment Station (Everglades Branch), Belle Glade, and associates are keeping current elevation measurements along selected profile lines through the Everglades. By checking landmarks—some established as early as 1914—and comparing recent drainage surveys with early ones, the scientists have found that the farmed peat and muck soils are subsiding at the rate of 1.25 inches a year. Some of our best soil has lost 40 percent in volume in less than 50 years of cropping. Almost the entire area, once ranging up to 20 feet of elevation, now stands at 12 feet or less above sea level. At this rate, the peats continuously drained since 1912 would be 88 percent used up by the year 2000, scientists estimate.

Studies at the Belle Glade station since 1934 show that all soil loss occurs above the water table, is in proportion to the release of carbon dioxide, and is directly dependent on the height of the water table.

Peats last 50 to 80 percent longer with water at the 24-inch level than they do with the table at 36 inches. If we are to continue cropping those soils—source of much of the country's winter vegetables—we must learn to farm them at the highest practical water tables. Most vegetables start well with water at 12 inches, grow to maturity with it at 24 inches. Grass thrives with water at 12 to 15 inches—much higher than has been generally recommended heretofore.

Much valuable information on water-level tolerance of the principal crops of the area is being gathered from Belle Glade and Fort Lauderdale studies. We must also develop economies to offset the increasing cost of draining the subsiding land. An efficient mole-drainage implement developed by Harrison and his associates is an example of the possibilities for achieving cheaper water control.

High water table desirable

To protect the Nation's valuable organic soils, water tables as high as crop and field conditions permit must become standard practice in our bog areas. They include the San Joaquin-Sacramento delta in California, the Klamath peat and muck plateau in northern California and southern Oregon, and peat soils scattered from Minnesota, Wisconsin, and Illinois eastward to New York, Massachusetts, and New Jersey and along the southeastern Coastal Plain region. ☆

Soil yesterday, today, tomorrow: 1957 Yearbook

■ A BROWSE THROUGH USDA's 1957 Yearbook of Agriculture on *Soil* is like a pause in the middle of a journey—a dimming reflection on yesterday's soil technology, vivid contemplation of today's better techniques, and speculation as to what's ahead.

Only decades ago, good soils seemed endless. Later, a shortage of good land threatened. But now, science shows us on the forward horizon a productive use through good management for lands relatively worthless by concepts we had a few years ago.

Soil management, the Yearbook tells us, was once considered simply a matter of replacing in the soil what the crop took. Now farmers try to supplement the nutrients in the soil, including micronutrients, to get top production. And they also improve the soil's physical condition for various productive benefits, primarily a better moisture regime.

We can hope for better ways of handling our problem soils, such as the millions of western acres with excessive lime that ties up iron in insoluble forms and causes plant chlorosis. A new class of chemicals, iron chelates, corrects this when used on such soils. Finding out how our cultural practices affect this problem is an urgent research objective on behalf of our future agriculture.

We fertilize to feed plants, but soil microorganisms get some of the nutrients first. We're developing soil management to impede harmful organisms and favor ones useful to plants as protectors against disease or superior sources of plant nutrients.

We've modified the view that soil pH primarily affects plants directly. Much of our future pH control will aim at dissolving tied-up mineral nutrients at rates species need them—neither a stint nor toxic excess.

This is a sample of the wealth of information that 142 Federal, State, and other specialists, under the editorship of Alfred D. Stefferud, have compressed into 88 chapters and 800 pages. The authors have tried to give their readers some of the scientific background of soil use and conservation. But primarily they had in mind a useful manual for farmers and gardeners and for the professional advisors who work with them. ☆

CASH CORN in the Southeast

The crop's new importance here has spurred studies on pest control, harvesting, storage

■ A CORN REVOLUTION is developing in the Southeast. Corn crops, once for farm animals and home consumption, are becoming cash crops as livestock increases in importance. Last year, the area grew 245 million bushels of corn compared with 190 million in 1941, USDA points out.

This means a need for new varieties, different types of equipment, and more effective disease, insect, and rodent control. Storage facilities must be built and marketing places arranged. So say ARS and Agricultural Marketing Service specialists.

Southern corn breeders are stressing husk protection from insects as well as shorter, lodging-resistant stalks easier to harvest by machine.

Dixie 18, a hybrid with tightly wrapped husks, has already replaced many of the older Southern varieties. Tight husks offer some of the needed protection against the corn earworm, which attacks corn in the field, and against the rice weevil, which infests in the field as well as later. But tightly wrapped shucks make husking with cornpickers, picker-shellers, or corn combine attachments difficult. This emphasizes the need to develop other ways to protect our valuable corn crop from insect infestations.

Loose husks or tight husks?

With the growing demand for corn as a feed, there is a trend to Corn Belt hybrids—which yield well and harvest easily but have loose husks that make them subject to insect damage. With power equipment, loose-husk varieties may be harvested and shelled quicker than those with tight husks. But many say advantages of loose husks are outweighed by disadvantages of corn-earworm or rice-weevil infestations in the field.

ARS entomologists are studying the corn earworm and seeking ways to fight the sugarcane borer, cornstalk borer, soil insects, and other field pests. A search for insecticides is underway in cooperation with Mississippi, Oklahoma, and Georgia Agricultural Experiment Stations.

Insects, diseases get study

Insecticide residues must be considered. Scientists must learn more about selecting and using insecticides to prevent excessive contamination of field-treated grain and stover. This also applies to cornmeal and grits produced for human consumption.

Biological control of insects is also underway. And leaf-spotting diseases are being investigated in cooperation with Georgia, Mississippi, North Carolina, and Florida Agricultural Experiment Stations.

AMS entomologists are studying the rice weevil in stored corn. Infestations of this and other storage insects can be minimized if the corn is harvested as soon as it is mature—that is, when the moisture content of the kernels has dropped to about 30 percent. Then the corn must be dried mechanically or stored as silage for direct feeding. (Before, corn was left on the stalk until natural drying reduced grain moisture content to safe storage level, or it was dried in a crib as earcorn, resulting in heavy infestations of costly pests.)

ARS agricultural engineers are experimenting in Athens, Ga., to develop low-cost mechanical driers—some using unheated air, some heated air. Then the grains can be stored in bins that are easy to fumigate and safe from insects. The use of plastic-film tarpaulins is being considered to fumigate corn on small farms that don't have tight grain bins.

Off-farm storage problems are under study by AMS engineers. Corn must be properly stored for protection against insects, moisture migration, high temperature, and contaminating odors. Moisture migration is caused in fall and winter by a temperature difference in the grain—usually cooler near the walls and warmer in the center of the bin. As warmer moist air reaches the cooler grain near the surface, condensation generally takes place. Some molding and caking of the surface grain often accompanies moisture accumulation.

Aeration saves stored grain

Tests show that circulating small volumes of cool air through grain to equalize the temperature prevents moisture migration and minimizes insect activity. This method, called aeration, has advantages over turning (moving grain from one bin to another). Aeration systems may also be used to circulate a fumigant.

In addition to new storage facilities for corn, market arrangements have been planned with more attention paid to selling by grades.

Mechanization is moving into the South. Midwest farmers went from hand methods to cornpickers, then to picker-shellers. Southeastern farmers may go directly to picker-shellers—harvest shelled corn, dry it mechanically, store the crop in bins—rather than pick ear corn and allow it to dry under conditions that will invite high insect and rodent losses. ☆

In case of EMERGENCY

Always watchful, regulatory workers could quickly expand to meet attack on our crops

INSPECTION of overseas traveler's baggage showed can presumably filled with olive oil contained dahlias, potential carriers of pests, diseases.

PART 3—CROPS

Port inspection-our first defense

■ A PEACETIME FEDERAL-STATE regulatory organization that can rapidly expand in an emergency is our best defense against biological warfare on our crops.

How is this vast organization geared to protect our plants from foreign pests and diseases?

First, we have developed a strong port-of-entry inspection to help keep pests and diseases from getting in. Thousands of lots of material are checked at our ports and we are constantly reviewing and expanding this inspection work. We work with other governments in recording pests that may threaten American agriculture. We acquaint American travelers with the risks of bringing in unauthorized plants and plant products. Movies, slides, cartoons, leaflets, radio, and television programs are utilized to educate civic groups all over the country. In addition procedures have been worked out for inspection at point of origin in some cases, including such things as mass military movements from foreign bases.

Detection, eradication ready for attack

Second, if serious plant pests or diseases do somehow slip in, we fall back on another line of defense—a continuing nationwide detection service followed up with immediate suppression or eradication.

WILTING, yellowing, stunting, are caused by witchweed, a parasite of corn, other crops. Weed's roots penetrate those of host plants, robbing them of food, water. Witchweed is low growing, has small reddish flowers, was first found here in fall of 1956.

HUNGRY Khapra beetle, considered world's worst pest of stored grain, causes tremendous damage. It's an import from the Far East and probably came here shortly after World War II. Millions are being spent by the States and Federal Government to eradicate it.

Among new threats to our crops

CONTRABAND intercepted from passengers' baggage at an international airport is checked in the Plant Quarantine laboratory for any signs of disease or insects. Travelers may unthinkingly bring in fruits, vegetables, plants—all possible pest, disease carriers.

We've greatly intensified our nationwide detection of plant pests through cooperative State-Federal surveys. One of their primary objectives is to promptly detect any new introductions that may have gained a foothold here. In addition, surveys provide information for growers and others on the prevalence of native pests that are likely to cause widespread damage to crops, thus contributing to more effective and less expensive controls. Through prompt dissemination of information, farmers are warned of impending epidemics, and industry has advance knowledge as to where and when large quantities of insecticides will be needed.

STUNTED, yellow plant (right) is result of infestation by soybean cyst nematode. Healthy plant (left) is unhurt. This disease takes a heavy plant toll.

Information on the occurrence and prevalence of foreign and domestic pests is collected by farmers, extension agents, and entomologists and sent to a centrally located State office. This may be the office of a college entomology department or an extension, State, or experiment station entomologist. Reports are forwarded to USDA, which then issues weekly information on new and economically important insects, as well as distribution maps and a wide variety of other materials.

Defense strengthened by surveys, schools

Many States have cooperative agreements with USDA to jointly finance an entomologist to head the State's insect survey. Training schools are held in some States to help farmers and other agricultural workers recognize important plant pests and diseases.

In the case of plant disease, key individuals in each State promptly give a central office reports on diseases new to an area, or unusual outbreaks of our more destructive domestic diseases. This information is passed on to a coordinator in USDA, which issues bibliographies, reviews, and articles, including a plant disease warning service. Through it, USDA issues forecasts, and reports on certain diseases of important crops.

Once an introduced insect has been pinpointed, eradication procedures are set in motion for a knockout blow. Sometimes we already have the research information to provide this blow. Sometimes we don't. If not, we attempt to confine the pest or disease to a small area to give our research workers a chance to develop more effective control or eradication procedures.

Quick action vital in meeting invasion

The importance of immediate eradication whenever possible is pointed up in the tremendous damage pests can do. Some not so important in their native habitats may become major pests when introduced into a new area with different crops and cultural practices.

The Khapra beetle, Mediterranean fruit fly, soybean cyst nematode, and witchweed—all costly newcomers here—are examples of some current problems.

It's imperative that we learn as much as possible about serious foreign pests and diseases before they become established here. State-Federal regulatory officials have made available color slides showing how to identify many of the world's worst pests. These slides may be obtained through USDA regulatory headquarters in Washington or State regulatory offices.

Success in our defense depends a great deal on the alertness of farmers, county agents, and homeowners. Damage from an unfamiliar plant pest or disease should be reported immediately to a county agent. ☆

1. Berries of improved variety Earliblue (right) ripen without dropping, lessening loss of fruit before harvest. One aim of breeders is to develop varieties that ripen much of the fruit at one time, yet hold high flavor and size.

2. To bring different varieties of blueberries into flower at the same time, plants selected for crossing may be held in hotbox at about 90° F. for 3 to 4 days. Plants are then moved to greenhouse with temperature at 65° to 70° F.

3. Blossoms of the early varieties of blueberries begin to open within 10 to 14 days. Researchers found that snipping tips off flower buds on cut branches shipped in by cooperators insures the shedding of pollen by weak buds that otherwise may not open.

4. To make cross, stigmas of emasculated blossoms of one variety are touched to pollen of another, on thumbnail. Horticulturist G. M. Darrow uses red nail coating to help see pollen grains and speed painstaking job of doing thousands of crosses.

5. Fruit harvested from the experimental crosses is pulped in water in electric blender for 30 seconds. The good seeds sink to the bottom and are easily filtered out. After surface drying, seeds are planted in sphagnum moss in greenhouse flats.

6. When seedlings are 4 to 5 inches high, they're transplanted to individual bands. In 6 to 7 months, the plants are established, about 18 inches high. Then they're packed in baskets, shipped to field stations for tests.

7. Plants are selected for further propagation after 3 years' growth, fruiting. Judges look for vigorous, open bush; resistance to disease, frost, drought; large fruit size, high flavor, light-blue color, good scar, nondropping quality.

beginning of a BLUEBERRY

Our blueberry industry is growing; these techniques are helping breed varieties for many areas

■ BIGGER, TASTIER, more productive, and lighter colored blueberries—tailored to market demands and to a variety of growing conditions—are being developed by USDA small-fruit breeders at Beltsville and at the cooperating Florida, Georgia, North Carolina, New Jersey, and Maine Agricultural Experiment Stations.

A new highbush blueberry that ripens 5 days later than Earliblue but has a similar large fruit size, small scar, color, flavor, nondropping quality, has been selected for naming and may be ready for distribution to growers next fall. Blueray, an early large-berried highbush recommended for the Northeast, and Tifblue and Homebell, two rabbiteye blueberries for the Coastal Plain from Virginia to Louisiana, made their debut in 1955. Bluecrop, a highbush blueberry introduced in 1952 for the North, proved its hardiness to drought and frost during last year's growing season when it produced a 70-percent crop, as against crops of 0 to 20 percent for other varieties.

Consumer appeal of improved blueberries marketed fresh, frozen, and canned has spurred growth of the cultivated-blueberry industry from 0 to 15,000 acres in 35 years. Acreage has doubled in the last 6 years and the crop now returns about $11 million annually. In New Jersey, for example, the blueberry has outstripped the strawberry in cash value and ranks third among fruits, next to apples and peaches. Blueberry production is also expanding in Michigan and other important growing areas.

Varieties bred to suit area

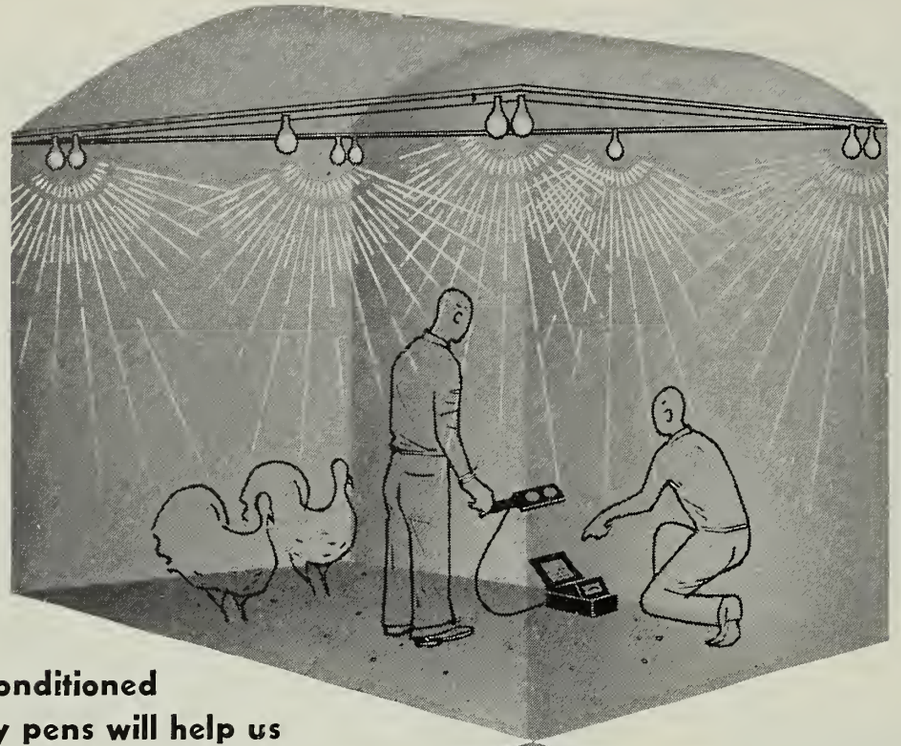
Blueberry breeders are concentrating on obtaining hardy or short-rest-period varieties for regions where the fruit cannot now be grown. Crosses are also planned to create better varieties for each area. Objectives are: Maine—half, quarter, and full highbush plants with early ripening, hardiness, and large berries. New Jersey—varieties resistant to mummy berry, some early and some late. North Carolina—very early ripening highbush plants resistant to canker and mites and vigorous rabbiteye plants, both bearing large, high-flavored, light-blue fruits that mature in a short period. Georgia—improved rabbiteye blueberries and hybrids ripening 6 weeks earlier than the native rabbiteye. Florida—varieties that need a short rest period and resist heat and drought.

At the New Jersey Agricultural Experiment Station, progress has been made in overcoming the troublesome fungus disease mummy berry. Applications of granular or dust Cyanamid or Premerge spray to soil beneath bushes were effective in controlling infection from the spore-bearing mummies. Controls are being sought for blueberry virus diseases—stunt, ringspot, mosaic, and shoestring. New techniques permit certifying virus-free nursery stocks.

Remedy found for chlorosis

Tests by the Ohio Agricultural Experiment Station indicate that iron chelates are a practical remedy for chlorosis of blueberries. Symptoms disappeared within 30 days after treatment, and plants showed vigorous growth with dark green foliage.

In the accompanying photographs, ARS horticulturist G. M. Darrow (recently retired) shows how better blueberry varieties are originated. ☆



Air-conditioned turkey pens will help us learn more about

Toms, Light, and Fertility

■ A NEW POULTRY HOUSE with light, temperature and humidity controls will enable scientists to widen research at USDA's Agricultural Research Center, Beltsville, Md.

The structure will be used to study the effects of light on reproduction in turkeys (AGR. RES., November 1953, p. 14). It is expected to be ready for use by mid-December, when turkeys are ready for breeding.

ARS studies on light effects on male turkey fertility have previously been complicated by difficulty in controlling temperature and humidity. These variables will be closely controlled in the new house, making reliable results easier to obtain.

Amount and *duration* of light a male turkey gets largely determine the amount of semen produced. Northern Hemisphere winter days have little light, and toms produce almost no semen. Production increases as days get longer. Too much light is as bad as not enough and may also result in partial sterility. ARS research so far points to 1.5 to 2.5 foot-candles of artificial light—used to extend available natural daylight for a daily light total of 13 to 15 hours—as most desirable. Commercial breeders should control wattage and placement of bulbs to obtain desired intensity. Otherwise, light (and tom fertility) can vary greatly.

Lighting is closely checked

Lighting in the new structure will be arranged so as to give the desired intensities—usually between 1.5 and 4 foot-candles as measured 18 inches above the floor—in each of the 6 pens. This is considered the most desirable range for research on fertility in male turkeys. Voltage regulators and calibrators will be used to assure the proper lighting intensity.

Various levels of lighting will be tried in ARS tests to determine effects on male turkey fertility. It's known that individual turkeys differ greatly in their light needs.

The new galvanized steel house is summer and winter air conditioned with three heat pumps hooked up to operate simultaneously. Heat pumps are refrigerating machines that heat and cool automatically as needed (AGR. RES., November 1953, p. 6).

Even temperature provided

This building, 60 feet long and 20 feet wide, can house up to 150 turkeys. A 4-foot feed lane extends the full length. An equipment room 28 feet long and 10 feet wide houses the heat pumps together with an electrostatic air filter, which gets rid of 90 to 95 percent of the dust particles.

A year-round temperature of 60° to 65° F. will probably be used. Conditioning equipment was designed to accommodate a 50° temperature differential. That is, outside temperature can be as much as 50° colder or warmer than the inside temperature (60° to 65° F.) and the inside temperature will still remain constant.

In addition to its usefulness in eliminating test variables for the studies on light and male fertility, the new house serves another purpose. It will show how best to use the new mechanical equipment to provide ideal artificial weather for specific purposes. There is much current interest in air-conditioning livestock shelters. Operation of this equipment may give some clues for the future design of such shelters.

Tentative plans are being made to use similar buildings for environmental studies of large animals. ☆

How to figure what a farmer can afford for pigs

■ THE PRICE A FARMER can afford to pay for feeder pigs depends on the value of the finished hogs, cost of raising them, and death loss, USDA agricultural economists point out. This guide is based on joint study by ARS and the Minnesota Agricultural Experiment Station.

To determine the finished value, a farmer first estimates the price at the time he will sell the hogs, and their probable weight. For example, if Mr. Jones wants to buy 35-pound feeder pigs in late May to sell in October, he may estimate the weight at 225, the price at $16. The weight is based on experience with rate of gain, and the price is a forecast. His expected income or net value at the farm is 225 pounds times $16 per hundredweight, or $36 altogether.

Probable costs should be estimated next. Figures vary from year to year and from farm to farm. But experimental results show the average midwestern farmer uses 350 pounds of corn and 50 pounds of protein supplement to add 100 pounds weight. This would be a total of 665 pounds (about 12 bushels) of corn and 100 pounds of supplement to increase Mr. Jones' 35 pounders to 225 pounds.

With corn at $1.15, the cost for 12 bushels would be $13.80. And with supplement at $5 a hundredweight, total cost would be $18.80.

Feed is the largest cost item, but labor, shelter, equipment, interest, and veterinary count, too. Usually, these amount to one-fifth of the feed cost. This is $3.76, bringing total production costs to $22.56.

Difference between income and total cost is the first estimate of the price a farmer can afford to pay for a feeder pig. This is $13.44.

But this figure should be adjusted for death loss. Probable survival rate is multiplied by the margin over cost per pig. Mr. Jones expects a death rate of 5 percent, or a survival rate of 95 percent. This is based on his own records. Multiplying margin per pig ($13.44) by 0.95 gives price per pig: $12.77 in this instance.

If Mr. Jones pays this price for a feeder pig, he can expect to get market price for his feed and average wages for his labor, and to cover all his costs for shelter, equipment, and other items. When a pig may be purchased for less than $12.77, the difference constitutes profit. ☆

Items to consider in starting a packing operation

■ FARMERS WHO WANT to own and operate their own slaughtering, processing, and merchandising facilities for livestock should first consider the records of previous meatpacking ventures. They should also realize what changes have occurred since the first plant was organized, says USDA's Farmer Cooperative Service.

Early cooperative attempts to slaughter and process livestock, between 1914 and 1920, failed chiefly because of lack of operating capital and member support, poor facilities, inadequate volume, inexperienced and unskilled management, keen competition, and unsatisfactory sales outlets. Of 13 cooperative packing plants that began operation between 1930 and 1955, only 5 are still in business.

But many changes have occurred, increasing chances of success. This includes decentralization of the industry, economical truck transportation, improved refrigeration methods, growth of local locker plants (AGR. RES., April 1957, p. 14), rapid expansion of frozen prepackaged meats with consumer acceptance, and new methods of curing and smoking meats.

Yet, producers should carefully examine the entire picture before establishing a plant. They should determine whether there is a real need for such a venture. They must decide whether they can realize more for livestock than in the past, and interest enough producers to assure a continuing flow of livestock in large enough volume to run economically.

Location must be considered in regard to transportation facilities. Plant size and equipment must be studied, as well as amount of money required, availability of experienced management, and adequacy of the market. Producers also must remember that new business enterprises often operate the first few years with little or no profit—it takes time to establish new brands in the trade. ☆

FROZEN FOODS

how long, how cold?

Time-temperature studies are contributing to quality in the products of this big industry

■ A FAST-GROWING frozen food industry is developing high-quality products with the help of USDA's Western Utilization Research and Development Division, Albany, Calif.

The Time-Temperature Tolerance Project is being conducted there to set up time and temperature limits for frozen foods from packer to consumer. Results of this 8-year-old study are aiding the development of industries that process, preserve, and market an important share of our farm products. The work is being done with wide industrial cooperation.

In the early days of the $2 billion frozen-food industry, research and experience established 0° F. or lower as a practical operating temperature. But rapid growth of the industry has brought to notice a number of questions that need to be answered.

Industry has new questions

For instance, what kinds of chemical, physical, and microbial changes occur in frozen food between 0° F. and higher temperatures? How fast does each one of these changes proceed under various conditions? How important is each type of change in the total quality value of the food?

This is how ARS research is finding the answers to these questions:

Scientists are analyzing the quality factors of freshly packed, commercially frozen foods. These factors include vitamins, flavor, color and texture. Then their rates of decline under commercial conditions are measured. Through use of elaborate equipment, researchers simulate the varying conditions these foods may meet during shipping, storage, distribution, and retail selling. Samples are evaluated at intervals, and the kinds and rates of quality loss are identified and carefully checked.

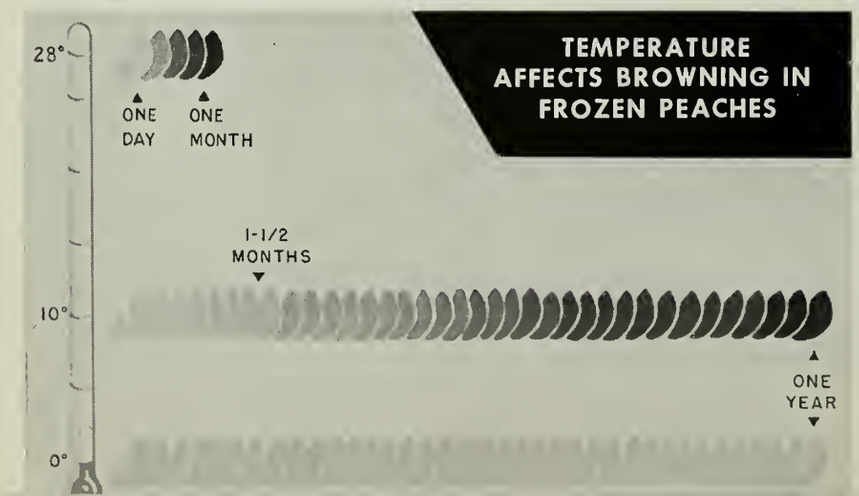
Many factors affect quality

Results of these tests spotlight problems as they occur in commercial operations. Packaging to exclude air was shown to be very important for some foods, less so for others. In some cases, inadequate destruction of enzymes and slow freezing were shown to result in quality losses.

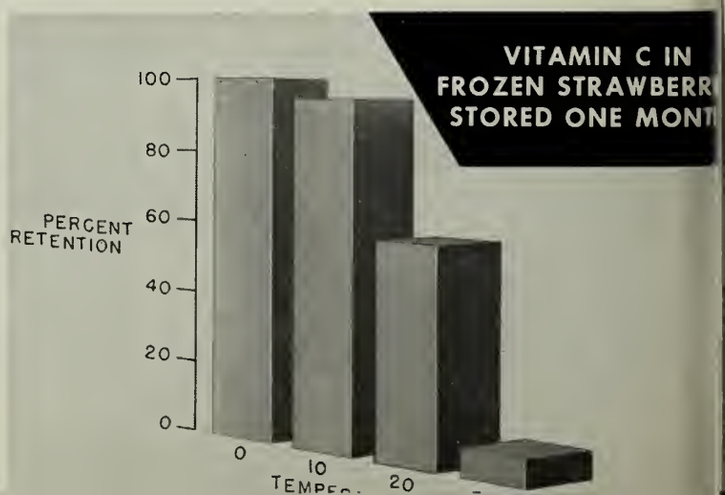
Studies so far indicate that care, more precise knowledge, better equipment, and maintenance of constant low temperature are most important in raising frozen-food quality.

Researchers have developed practical tests for quality at various stages in commercial life. Retention of ascorbic acid in certain fruits and vegetables, for example, is closely re-

BROWNING in frozen peaches progresses very rapidly unless checked by lowering storage temperature and reducing air in packages. Product lasts up to year if stored at 0° F. As the temperature rises, browning increases. In storage at 10° F., browning starts in 1½ months; at 28° F., in day.



VITAMIN C is speedily lost when frozen strawberries are stored at temperatures above 0° F. Retention of this important vitamin runs about 100 percent when frozen berries are stored for a month at 0° F. Only a fraction remains at 30° F.



lated to retention of color and flavor. The amount of red color in the sirup of frozen raspberries indicates the temperature at which it was stored.

Other tests that are easy to use and yield readily usable facts on quality are being evaluated and recommended. Much practical information is coming out of studies on rate of temperature changes in cases and pallet loads. Methods have been devised to measure the product temperature without opening the case.

These studies are helping the frozen-food industry to improve its low-temperature handling methods. The industry is doing this by training its employees to handle frozen foods properly and by correcting bad practices wherever they're found.

This research is also benefiting industry by supplying facts that measure, for instance, how much it costs in quality to hold a frozen food above zero for varying periods. Generally, hours at 25° to 30° F. are equivalent to weeks at 15° to 20° F., to months at 0° F. or lower temperature.

Research helps avoid losses

Such basic facts are helping frozen-food dealers avoid the less perceptible early quality losses that become more obvious later on. This research is also disproving the widespread misconception that returning frozen food to 0° F. after exposure to higher temperatures reduces the undesirable changes that have taken place. And studies have disproved the common belief that a hard-frozen package is *always* adequately cold.

The Time-Temperature Tolerance Project began originally with testing some 50,000 samples of fruits and orange juice. The work was soon expanded to include vegetables, chickens, turkeys, and prepared foods. Wide interest suggests that similar work might be valuable in assessing other frozen foods and foods processed and handled in other ways. ☆

sizing up our children

■ CAN WE SAY WHAT SIZE a child should be at any given age? Research data compiled by USDA's Institute of Home Economics indicate that there is no one optimum weight or height applicable to every child.

Height-weight data have been collected for many years by nutritionists, physicians, nurses, teachers, and anthropologists in different parts of the United States. In some cases, detailed records of the same children have been kept over long periods to determine their rate of growth; in other cases, single measurements have been made of large groups of children to get average figures for various ages.

Little had been done, however, to bring together or relate the figures from the various studies, partly because the data are voluminous and widely scattered. Yet the need for such a summary has grown with nutrition progress and research advances in a number of fields.

Now ARS nutrition specialist Milicent L. Hathaway has assembled the data in Home Economics Research Report 2, a handbook for nutritionists and others interested in growth and physical condition of children. The height, weight, and age figures of white children in the United States, from ages 2 through 18 years, are arranged by age, sex, and date and place of study. The figures are given in both metric and English units. Both published and unpublished data made available through the cooperation of researchers in various fields are included.

Eight of the often-used height and weight standards for appraising growth and nutritional status are also presented for comparison. The study shows that no single set of standards appears to be satisfactory for all groups in this country, since children vary according to natural background, socioeconomic status, and geographic location.

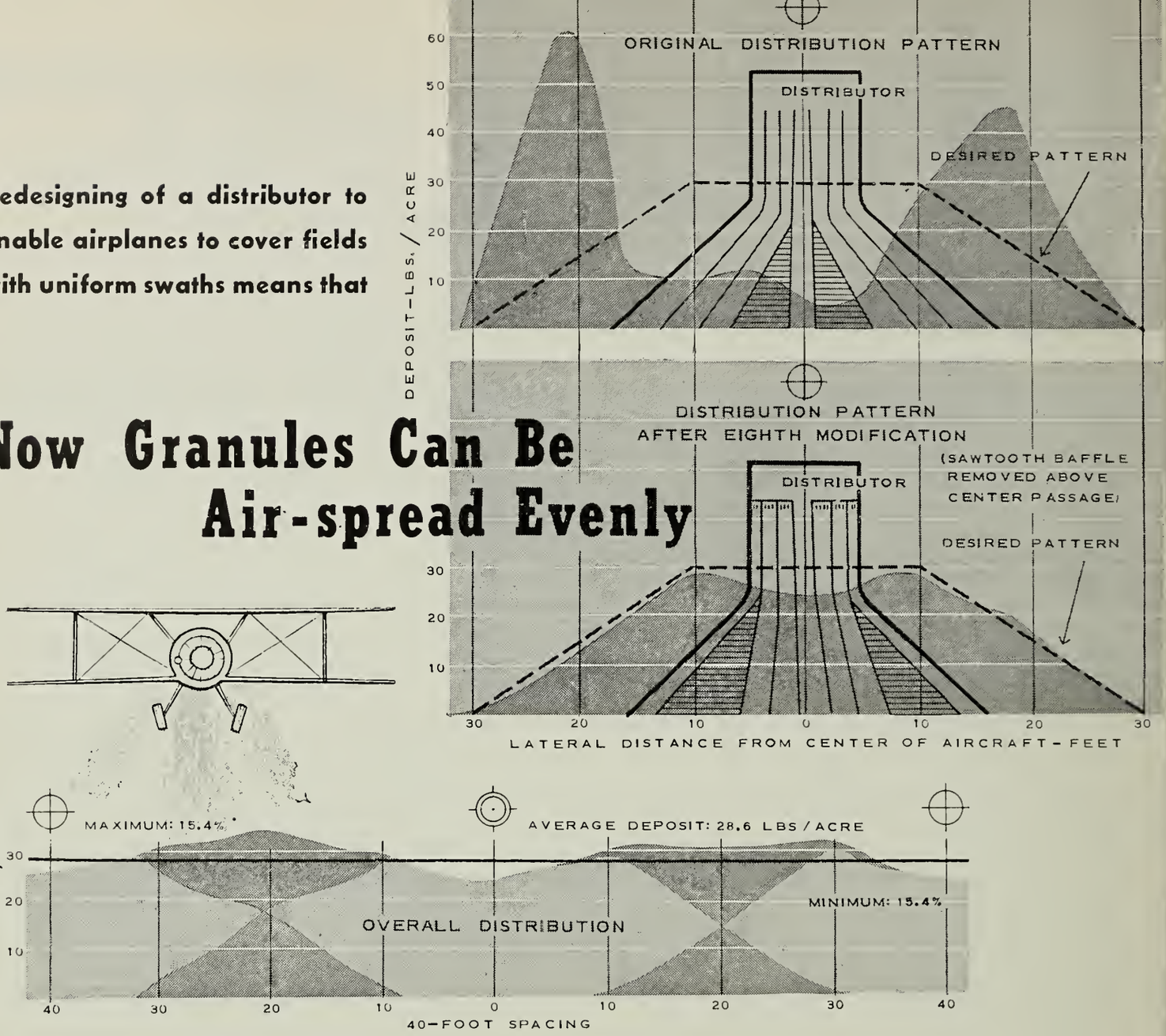
Furthermore, many factors have had an effect that we couldn't evaluate individually on children's growth trends over the years. For example, during the past 50 years, changes have occurred in economic conditions, in food supplies, and in awareness of nutritional and health needs of children. Large-scale measures—such as food enrichment, school lunch, and nutrition education—have improved the nutrient levels of diets. Expanded medical knowledge and public health services have meant better control of many communicable diseases.

Within groups, too, children vary greatly. Pubescence—a period marked by rapid growth—accounts for much of the variation, since individuals mature at different ages. Early-maturing children are taller and heavier at any given age than average-maturing children, who in turn are taller and heavier than late-maturing ones. As children approach adult stature, average weights continue to differ, the early-maturing children being heaviest and the late-maturing ones lightest.

The researchers say that an individual's own height-weight records, kept systematically over the years, afford a much more reliable indication of his status and growth potential than a group standard. ☆

Redesigning of a distributor to enable airplanes to cover fields with uniform swaths means that

Now Granules Can Be Air-spread Evenly



■ Granulated insecticides may be evenly distributed from aireraft with a fan-shaped spreader designed by USDA in cooperation with the Texas Agrieultural Experiment Station.

This provides a uniform swath for treating fields infested with white-fringed beetle, and possibly with a number of other inseets.

Specialists modified the original seeding and dusting spreader. The angle and location of the vanes went through several alterations. Eventually, the designers sueceeded in rearranging vanes to give uniform distribution of granular material.

Experiments were conducted with a Stearman airplane with a 450-horsepower engine. The material applied was a granulated clay that passed through a 30-mesh screen and remained in a 40-mesh sereen. Then ARS researchers used dieldrin in Tennessee, Georgia, and Alabama experiments against the write-fringed beetle. The distributor gave a uniform swath pattern at an altitude of between 25 and 70 feet at an airspeed of 100 miles per hour with application rates of 20 to 30 pounds per aere.

The new spreader will undergo further tests in different environments of other States against the white-fringed beetle, which attacks peanuts, alfalfa, eotton, soybeans, and many vegetables and weeds. The possibilities of using the spreader to treat other inseets will be studied.

Tests will also be made with some other insectieides. The finer the material, the more eomplete the distribution. The heavier the material, the less blowing there is apt to be during application. The distribution pattern of granulated inseetieides is not affected as much by erosswinds and turbulenee as the pattern of fine-particled dusts or sprays. ☆

Muscadine for South

Our newest and best perfect-flowered muscadine grape yet introduced has just been named Dearing and released for use in the South. It has both male and female organs in the same flower, so is self-fertile.

Dearing is a medium-sized, translucent green, late-midseason variety.

Relatively sweet and tasty, it will be welcome as an addition to home vineyards and also as a pollinizer of commercial pistillate varieties.

The new variety resulted from cooperative breeding work by USDA and North Carolina Agricultural Experiment Station (Coastal Plain Branch) at Willard. Dearing was named for ARS horticulturist Charles Dearing (retired), who originated it as well as six other perfect-flowered varieties released a few years ago.

The perfect-flower character traces to 3 chance seedlings found years ago—1 in the wild and 2 in experimental nurseries. Muscadines grown previously were dioecious—bore only pistils or stamens, but not both, in the flowers of a given vine. Therefore, it was necessary to interplant the fruit-bearing pistillate vines with male vines in order to set fruit.

FA cotton a "comer"

A USDA-developed chemical treatment gives cotton valuable new qualities. The treatment produces fully acetylated (FA) cotton—better for some purposes than partially acetylated (PA) cotton developed earlier. In laboratory tests, the new cotton showed greatly improved heat and rot resistance while retaining most of the natural abrasion resistance and other good qualities of untreated cotton. FA cotton is superior in strip breaking strength to both PA and untreated types. The new fabric looks like untreated cotton but feels harsher. This can be controlled by treating with softening agents. FA cotton is heavier than the untreated variety but dries quite a bit more rapidly.

The new cotton dyes quickly in a wide range of shades and colors. Pleats press in easily and can be repressed or reset after laundering. FA cotton has potential for industrial use and as a popular clothing fabric. Developed by ARS Southern Utilization Research and Development Division, New Orleans, it is not yet ready for commercial manufacture.

Beltsville cow has record

A 4-year-old Holstein cow—BDI Algado Olive 3,597,145—in USDA's herd at Beltsville, Md., recently set a new breed butterfat production record under advanced registry. She produced 1,178 pounds of butterfat in 365 days, milked twice daily under rigid test conditions. The previous record was 1,051 pounds.

In making the new butterfat record, Olive produced 23,981 pounds of milk (not a record, itself), which averaged 4.9 percent in butterfat.

Knollwood Alcatra Chieftain 847,579, owned by New York Artificial Breeders Cooperative, is Olive's sire. BDI Galax Oread 2,756,566, of the Beltsville herd is her dam.

Olive's record emphasizes the high productivity of the Beltsville herd as a whole. It attained through 35 years of proved-sire breeding the rank of top honor Holstein herd in the Nation in 1955 and third last year. Since the herd was closed against introduction of outside cows and feeding and management were standardized in 1922, paternal stock has been the only source of improvement. Average production rose steadily. The tradition is carried forward in two of Olive's daughters. One produced 14,248 pounds of milk and 629 pounds of butterfat in her first year milked. The other is pushing that record in her first lactation, now underway.

Connecticut Certified

Connecticut has been declared modified certified brucellosis free—the third State this year, and eighth altogether, so designated. This means not more than 1 percent of the State's cattle and not more than 5 percent of the herds have brucellosis.

Other States that have received certification include Delaware, Maine, Minnesota, New Hampshire, North Carolina, Washington, and Wisconsin. Also 440 counties in 27 other States and in Puerto Rico now have gained modified brucellosis-free status.

Graze or "green-chop"

Green-chop feeding for dairy herds may be more profitable than grazing animals, USDA research shows.

Grassland-produced feed is used more efficiently when green-chopped, according to a cooperative study by ARS and Pennsylvania Agricultural Experiment Station on a typical dairy farm. Changing from grazing to green-chop feeding could enable this farmer to add three cows to his herd, says agricultural economist K. H. Myers. The operator, who has excess barn space and adequate labor, could increase income $400 to $600 a year

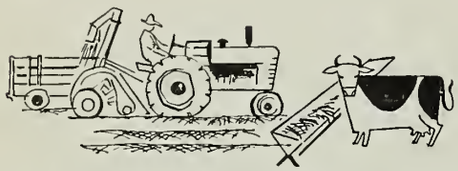
UNITED STATES GOVERNMENT PRINTING OFFICE
DIVISION OF PUBLIC DOCUMENTS, WASHINGTON 25, D. C.

OFFICIAL BUSINESS

PENALTY FOR PRIVATE USE TO AVOID PAYMENT OF POSTAGE, $300 (GPO)

after paying interest on additional capital needed for new equipment.

Field choppers are used to convert heavy grass crops into feed. The hourly overhead on a chopper is cut when it's used not merely for a few



days a year to make silage but daily each summer to green-chop feed.

Self-unloading wagons and feed bunks also are required. But the cost of these items is partially offset by less travel in taking cows to and from pasture, less need for fencing, and elimination of extensive watering systems in the farm's distant pastures.

Furthermore, cows trample and waste up to 40 percent of the feed while grazing on lush growths.

Fruits for Great Plains

Nine new fruit varieties with superior qualities for home gardens in the northern Great Plains are announced by USDA. They include 4 apples, 2 plums, 2 sand-cherry plums, 1 apricot. They're recommended for trial in North and South Dakota, eastern parts of Montana, Wyoming, and Colorado, and in northern Minnesota.

Apple varieties are: Garrison—round, long stemmed, medium firm, juicy, mildly acid; Thorberg—oblate, juicy, slightly tart, pleasant tasting; Peace Garden—medium, round to slightly oblate, very firm, mildly acid, juicy; Killand—medium to slightly below in size, bright red, a good storage apple, which is at its best for use in the fall and winter seasons.

Plums include Gracious and Chinook. Both are large. Gracious is resistant to brown rot. Chinook is a good pollinizer for other plums.

Sand-cherry plums include Sagawea and Hiawatha. Both are especially good for jam but are very vulnerable to cold. The new apricot is Mantoy—good for eating or cooking but also vulnerable to winter cold.

Nurserymen can get scions or budsticks (no trees) at Northern Great Plains Field Station, Mandan, N. Dak.

Aphid-resistant alfalfa

A new nonhardy variety of alfalfa, Moapa, highly resistant to the spotted alfalfa aphid, has been developed jointly by USDA and the Nevada Agricultural Experiment Station.

This variety was bred by ARS agronomists O. F. Smith, R. Peaden, and others at Reno, and resistance-tested by entomologist W. L. Howe.

Moapa is the second highly resistant variety (Lahontan was the first) developed in Nevada. Growers in Nevada, California, and Arizona, where Moapa is adapted, can expect to get certified seed by late in 1958.

Novel idea on shade

Livestock need protection against excessive radiant heat from the hotter portions of the sky as well as from the sun itself. Animals are not completely shielded just by shading out the sun's direct rays.

Since some areas of the sky are relatively cool, scientists of USDA and the California Agricultural Experiment Station, working at El Centro in the Imperial Valley, are cooperatively exploring the possibility of shading animals from the sun and warmer areas of the sky while exposing them to the cooler areas.

At El Centro, instruments show the coolest part of the sky at noon is in the north at about 60° above the horizon. The reflection of the north sky at noon against a high, vertical, east-west wall with a perfect reflecting north surface was 45° F. lower than the 120° F. average for the south sky. On a hot, clear, summer day an animal fully exposed to the relatively cool part of the sky would feel

as though the surrounding air were 20° to 30° F. cooler because the animal would radiate some heat to this relatively cool area. But use of a wall for shade would not be generally practicable because of sun movement as well as some other reasons.

Ingenuity is needed to make use of the relatively cool areas of the sky. Scientists are investigating this theoretical problem in search of a more effective means of protecting animals from the very high temperatures.

U. S. GOVERNMENT PRINTING OFFICE: 1957